WE CLAIM:

Sub A1

1. A method of storing data in a database, the method comprising the steps of:

obtaining both a raw form of a data to be stored and a normalised form of said data; and

storing concurrently both the normalised form and the raw form of said data.

2. A method of storing data in a database, as claimed in claim 1, wherein said obtaining step comprises:

first obtaining a raw form of a data and thereafter generating said normalised form from said raw form of the data.

3. A method of storing data in a database, as claimed in claim 1, wherein said storing step comprises:

maintaining both the normalised form and the raw form of the data for data base searching and data retrieval.

4. A method of storing data in a database, as claimed in claim 3, wherein said maintaining step comprises maintaining said raw form and normalised form of a data in at least one table.

5. A method of storing data in a database, as claimed in claim 4 , wherein said maintaining step further comprises correlating the storage location of said raw form and said normalised form in said at least one table.

Sub B1

6. A method of storing data in a database, as claimed in claim 2, wherein said generating step comprises:

applying directory service attribute syntax rules to the raw data.

7. A method of enabling data to be arranged and/or stored in a database used in a directory service system, the method including the steps of:

a. applying directory service attribute syntaxes rules to the data, and

b. creating a normalised form of the data.

8. A method of enabling data to be arranged and/or stored in a database as claimed in claim 7, further comprising:

c. storing said data and the normalised form of the data concurrently in at least one table.

9. A method of enabling data to be arranged and/or stored in a database as claimed in claim 8, wherein said at least one table comprises a plurality of columns and a plurality of rows, and said storing step comprises storing said data and said normalised form of the data in related locations.

10. A method of enabling data to be arranged and/or stored in a database as claimed in claim 9, wherein said locations in a table are related by being in a common row.

11. A method of enabling data to be arranged and/or stored in a database as claimed in claim 8, wherein said at least one table comprises a HIERARCHY table and an OBJECT table.

Sub A2 12. A method of locating data in a database, wherein said data is stored linked to a normalised form of the data, comprising the step of:

locating said data by searching on said normalised form of the data.

13. A method of locating data in a database, as claimed in claim 12, wherein said searching is performed using SQL.

14. A method of locating data in a database, as claimed in claim 12, wherein said searching is performed on an OBJECT table, comprising a plurality of columns and a plurality of rows.

15. A method of locating data in a database, as claimed in claim 14, further comprising for a data entry:

specifying an attribute ID (AID), said AID being stored in a first one of said plurality of columns and in a predetermined row;

storing an entry ID (EID), said EID being stored in a second one of said plurality of columns and in said predetermined row;

storing a normalised form of said data entry in a third one of said plurality of columns and in said predetermined row.

16. A method of formatting a find request for a database having stored therein objects including attributes each having a type and value(s), the method including:

a. creating a database representation of the type (AID), and

b. creating a database representation of the value(s) (NORM).

17. A method as claimed in claim 16, wherein step a. is performed by looking up an ATTRIBUTE table.

18. A method as claimed in claim 16, wherein step b. is performed by applying syntax normalization.

19. A method of locating objects stored in a database, the method comprising the step of applying AID and NORM to determine a matching object (EID), wherein the method of claim 16 is used to determine AID and / or NORM

20. A method of locating objects stored in a database, the method comprising the step of applying AID and NORM to determine a matching object (EID), wherein the method of claim 17 is used to determine AID and / or NORM

21. A method of locating objects stored in a database, the method comprising the step of applying AID and NORM to determine a matching object (EID), wherein the method of claim 18 is used to determine AID and / or NORM

22. A method of locating objects stored in a database, the method comprising the step of applying AID and NORM to determine a matching object (EID).

23. A method as claimed in claim 22 wherein the step of applying is performed using SQL.

24. A method of retrieving contents of object(s) from a database, the method including the step of:

a. finding row(s) which match a predetermined EID(s).

25. A method as claimed in claim 24 further including the step of:

b. returning from the row(s), EID, AID and a raw form.

26. A method as claimed in claim 25, further including the step of:

c. converting the result of step b. into objects containing attribute(s), each attribute having a type and value(s).

27. A method of providing data as an output from a database, the output being in response to a directory service/query, the method comprising the steps of:

processing said directory service/query to identify said data in the database; and

providing as the output, a raw form of the data.

28. A method of providing data as an output from a database, as claimed in claim 27, wherein said processing step is based on other than said raw data.

29. A method of providing data as an output from a database, as claimed in claim 28, wherein said processing step comprises a comparison of data directly corresponding to said raw data but in normalised form.

30. In a directory service system, having a database in which data is stored in a first form, being a raw form, and a second form, being a normalised form, a method of transferring data into and out of the database, the method including the steps of:

finding data in the database using a normalised form; and

transferring data out of the database using a raw form.

Sub A3

31. A database apparatus comprising:

means for obtaining both a raw form of a data to be stored and a normalised form of said data; and

a storage medium for storing concurrently both the normalised form and the raw form of said data.

32. A database apparatus for storing data in a database, as claimed in claim 31, wherein said means for obtaining comprises:

means for first obtaining a raw form of a data and thereafter generating said normalised form from said raw form of the data.

33. A database apparatus for storing data in a database, as claimed in claim 31, wherein said storage medium is operative to maintain both the normalised form and the raw form of the data for data base searching and data retrieval.

34. A database apparatus for storing data in a database, as claimed in claim 33, wherein said storage medium is operative to maintain said raw form and normalised form of a data in at least one table.

35. A database apparatus for storing data in a database, as claimed in claim 33, wherein said s

torage locations of said raw form and said normalised form of data are correlated in said at least one table.

36. A database apparatus for storing data in a database, as claimed in claim 32, further comprising:

means for applying directory service attribute syntax rules to the raw data.

37. An apparatus for enabling data to be arranged and/or stored in a database used in a directory service system, comprising:

a. means for applying directory service attribute syntaxes rules to the data;

b. means for creating a normalised form of the data; and

c. means for storing said data and the normalised form of the data concurrently in at least one table.

38. An apparatus for enabling data to be arranged and/or stored in a database as claimed in claim 37, wherein said at least one table comprises a plurality of columns and a plurality of rows, and said storing step comprises storing said data and said normalised form of the data in related locations.

39. An apparatus for enabling data to be arranged and/or stored in a database as claimed in claim 38, wherein said locations in a table are related by being in a common row.

40. An apparatus for enabling data to be arranged and/or stored in a database as claimed in claim 37 wherein said at least one table comprises a HIERARCHY table and an OBJECT table.

Sub A4

41. An apparatus for locating data in a database, wherein said data is stored in a table and linked to a normalised form of the data, comprising:

means for locating said data by searching on said normalised form of the data.

42. An apparatus for locating data in a database, as claimed in claim 41 wherein said searching is performed using SQL.

43. An apparatus for locating data in a database, as claimed in claim 41, wherein said searching is performed on an OBJECT table, comprising a plurality of columns and a plurality of rows.

44. An apparatus for formatting a find request for a database having stored therein objects including attributes each having a type and value(s), the apparatus including:

a. means for creating a database representation of the type (AID), and

b. means for creating a database representation of the value(s) (NORM).

45. An apparatus as claimed in claim 44, wherein said means for creating is operative to create a representation by looking up an ATTRIBUTE table.

46. An apparatus as claimed in claim 45, wherein said means for creating is operative to create the data base representation by a means for applying syntax normalization.

47. An apparatus as claimed in claim 44 is operative to determine AID and / or NORM.

48. An apparatus as claimed in claim 45 is operative to determine AID and / or NORM.

49. An apparatus as claimed in claim 46 is operative to determine AID and / or NORM.

50. An apparatus as claimed in claims 46, wherein the means for applying uses SQL.

51. An apparatus for locating objects stored in a database, the apparatus comprising means for applying AID and NORM to determine a matching object (EID).

52. An apparatus as claimed in claim 51, wherein the means for applying uses SQL.

53. An apparatus for retrieving contents of object(s) from a database, the apparatus comprising:

a. means for finding row(s) which match a predetermined EID(s).

54. An apparatus as claimed in claim 53, further comprising:

b. means for returning from the row(s), EID, AID and a raw form.

55. An apparatus as claimed in claim 54, further comprising:

c. means for converting the output of the means for returning into objects containing attribute(s), each attribute having a type and value(s).

Sub A5

56. In a directory service system, having a database in which data is stored in a first form, being a raw form, and a second form, being a normalised form, apparatus for transferring data into and out of the database, comprising:

means for finding data in the database using a normalised form; and

means for transferring data out of the database using a raw form.

57. A computer program product, including a storage medium for storing a computer program, the computer program being executable to perform a method as claimed in any one of claims 1-29.

58. A method as claimed in any one of claims 1-6 and 27-29 wherein the raw form of data is stored in ASN.1 format.

59. A directory service system as claimed in any one of claims 30 and 56 wherein the raw form of data is stored in ASN.1 format.

Sub A6

60. An apparatus as claimed in any one of claims 31-43 wherein said raw data or data is stored in ASN.1 format.

61. The invention as herein disclosed.